



US009243657B2

(12) **United States Patent**  
**McCorkell**

(10) **Patent No.:** **US 9,243,657 B2**  
(45) **Date of Patent:** **Jan. 26, 2016**

(54) **FASTENER RETAINING DEVICE**

(56) **References Cited**

(71) Applicant: **Magna Closures Inc.**, Newmarket, CA  
(US)

U.S. PATENT DOCUMENTS

5,419,714 A \* 5/1995 Nagamine ..... 439/364  
5,536,124 A 7/1996 Silva

(72) Inventor: **John P. McCorkell**, Orillia, CA (US)

(Continued)

(73) Assignee: **Magna Closures Inc.**, Newmarket (CA)

FOREIGN PATENT DOCUMENTS

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

DE 4131779 A1 3/1993  
DE 202005014924 U1 1/2006  
EP 1096156 B1 5/2005

OTHER PUBLICATIONS

International Search Report and Written Opinion dated Apr. 3, 2013  
issued from the Canadian Intellectual Property Office relating to PCT  
International Application No. PCT/CA2013/000030.

(Continued)

(21) Appl. No.: **14/333,722**

(22) Filed: **Jul. 17, 2014**

(65) **Prior Publication Data**

US 2014/0328644 A1 Nov. 6, 2014

*Primary Examiner* — Gary Estremsky

(74) *Attorney, Agent, or Firm* — Grant Tisdall; Gowling  
Lafleur Henderson LLP

**Related U.S. Application Data**

(63) Continuation of application No.  
PCT/CA2013/000030, filed on Jan. 17, 2013.

(60) Provisional application No. 61/587,286, filed on Jan.  
17, 2012.

(51) **Int. Cl.**  
**F16B 39/00** (2006.01)  
**F16B 39/02** (2006.01)  
(Continued)

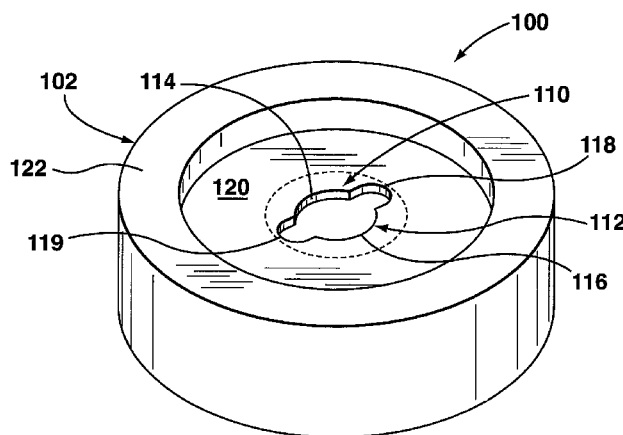
(52) **U.S. Cl.**  
CPC ..... **F16B 39/02** (2013.01); **B60J 5/0468**  
(2013.01); **F16B 41/002** (2013.01); **F16B**  
**37/0842** (2013.01)

(58) **Field of Classification Search**  
CPC .... F16B 39/02; F16B 37/0842; F16B 5/0208;  
F16G 41/002; B60J 5/0468  
See application file for complete search history.

(57) **ABSTRACT**

An integrally molded object body is disclosed for retaining fasteners in a pre-attachment position and deforming to accommodate attachment tolerances. The object body has a fastener retaining portion that has an aperture defined therein that has a fastener-engaging edge that grips the shaft of the fastener in the pre-attachment position. The fastener retaining is deformable to allow the fastener to move laterally and be attached off-center from the pre-attachment position to accommodate attachment tolerances. The fastener retaining portion can have areas of weakness to allow deformation. These areas of weakness can comprise areas of reduced thickness or radial extensions that extend towards the perimeter of the fastener retaining portion. The object body also has a clearance portion that defines a mounting face that the fastener does not extend past in the pre-attachment position. The object body can further comprise a compression portion that engages with the shoulder of the fastener and is compressed between the shoulder the object that the object body is attached onto in the attachment position. The compression portion can also have a bushing that provides increased torque retention by engaging with the fastener shoulder and the object that the object body is attached onto.

**15 Claims, 10 Drawing Sheets**



(51)	<b>Int. Cl.</b>		2008/0115419 A1 *	5/2008	Karumuri .....	49/501
	<b>B60J 5/04</b>	(2006.01)	2008/0219758 A1	9/2008	Jatzke	
	<b>F16B 41/00</b>	(2006.01)	2008/0276541 A1 *	11/2008	Roy et al. ....	49/502
			2009/0197724 A1	8/2009	Young	
	<b>F16B 37/08</b>	(2006.01)	2010/0260578 A1	10/2010	Ullein	

(56) **References Cited**

U.S. PATENT DOCUMENTS

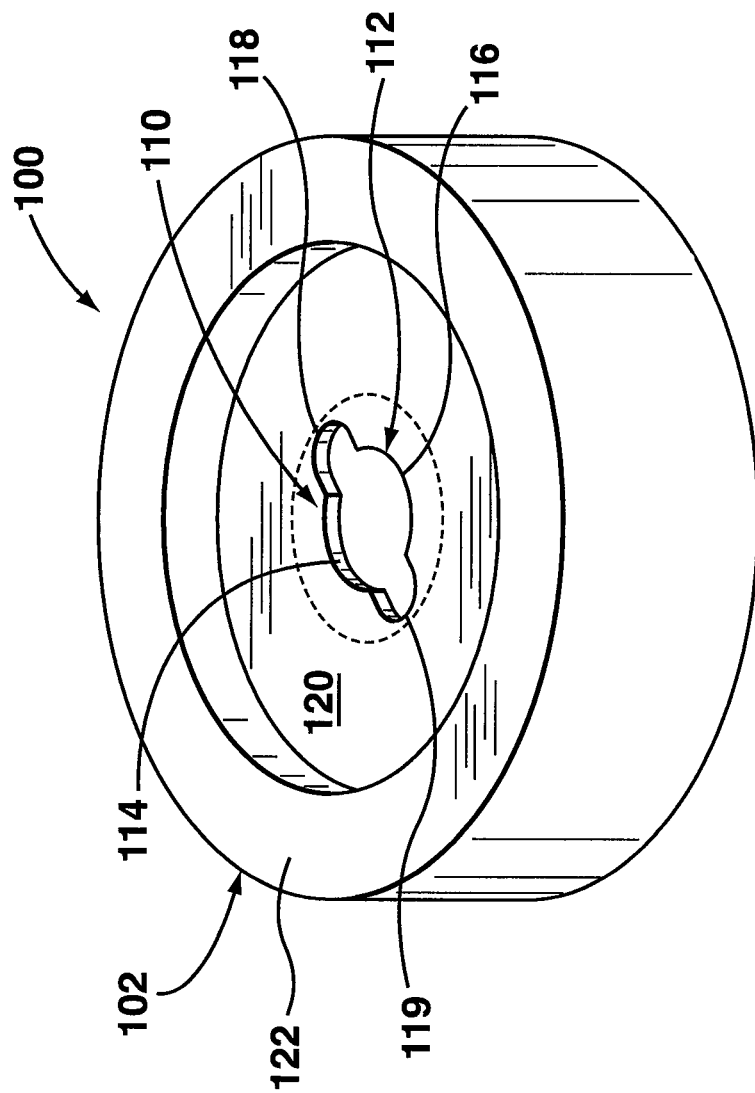
6,357,953	B1	3/2002	Ballantyne	
6,862,846	B1 *	3/2005	Kirejczyk .....	49/502
7,959,214	B2	6/2011	Salhoff	
8,061,947	B2	11/2011	Van Tiem et al.	
8,393,986	B2 *	3/2013	Young .....	474/101
2005/0198761	A1	9/2005	Baskerville et al.	

OTHER PUBLICATIONS

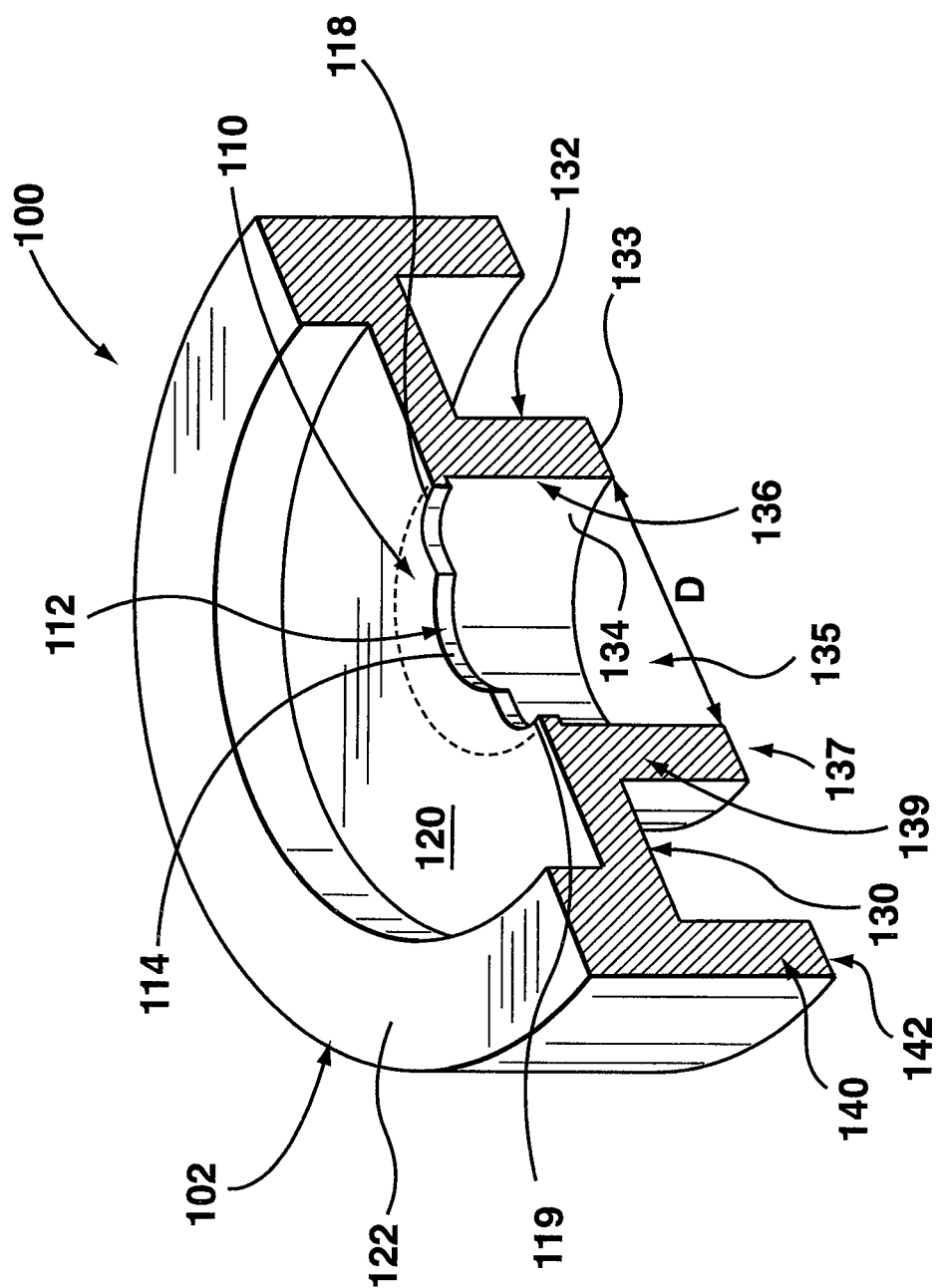
Supplementary European Search Report dated Jul. 10, 2015 issued from the European Patent Office relating to corresponding European Application No. 13738404.6.

Extended European Search Report dated Jun. 23, 2015 issued from the European Patent Office relating to European Application No. 13738404.6.

\* cited by examiner

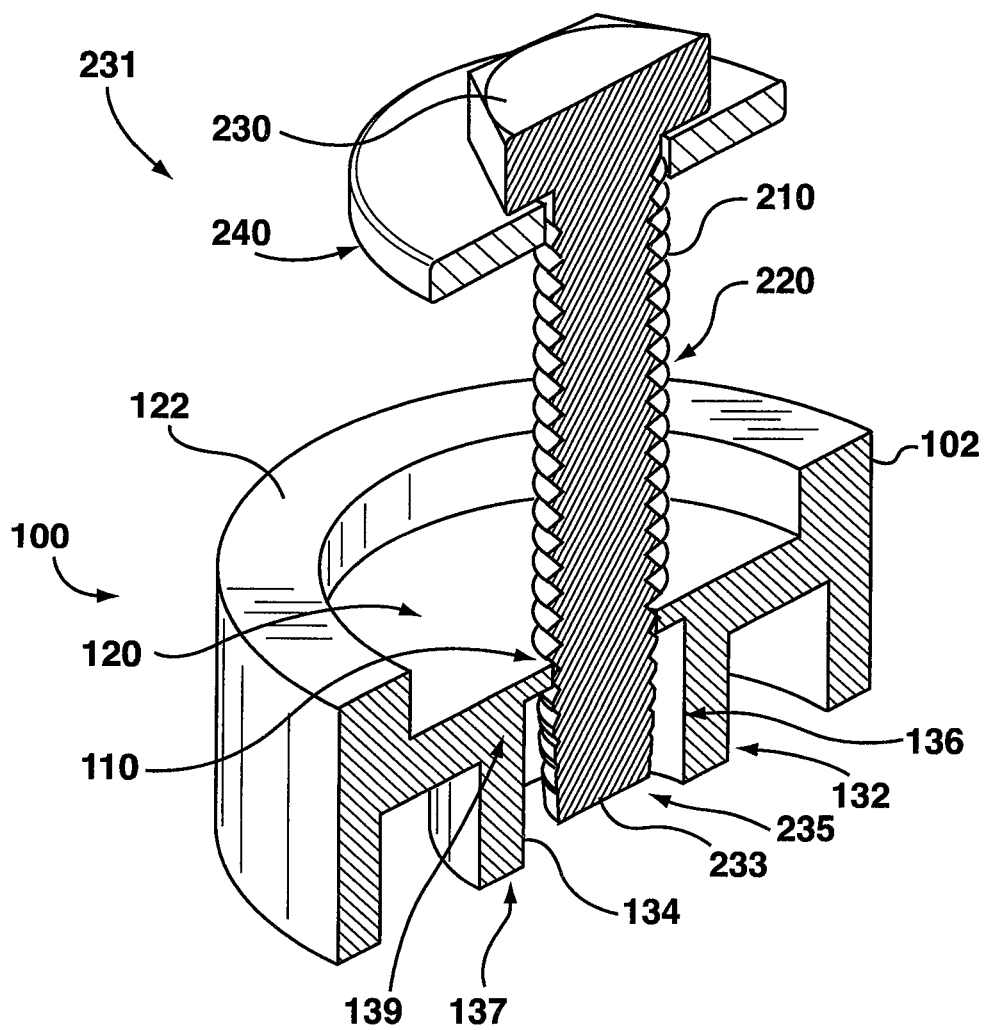


**FIG. 1**

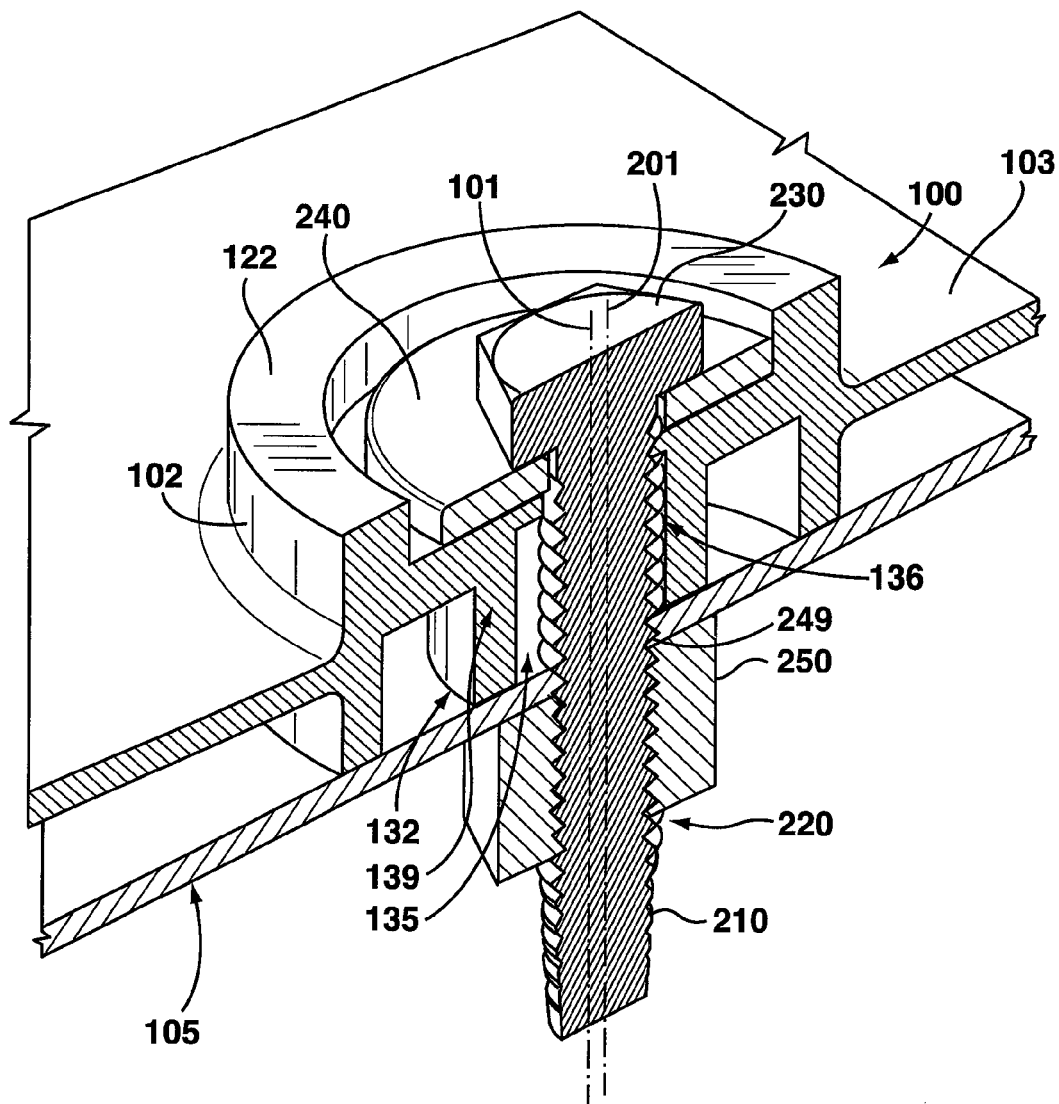


**FIG. 2**

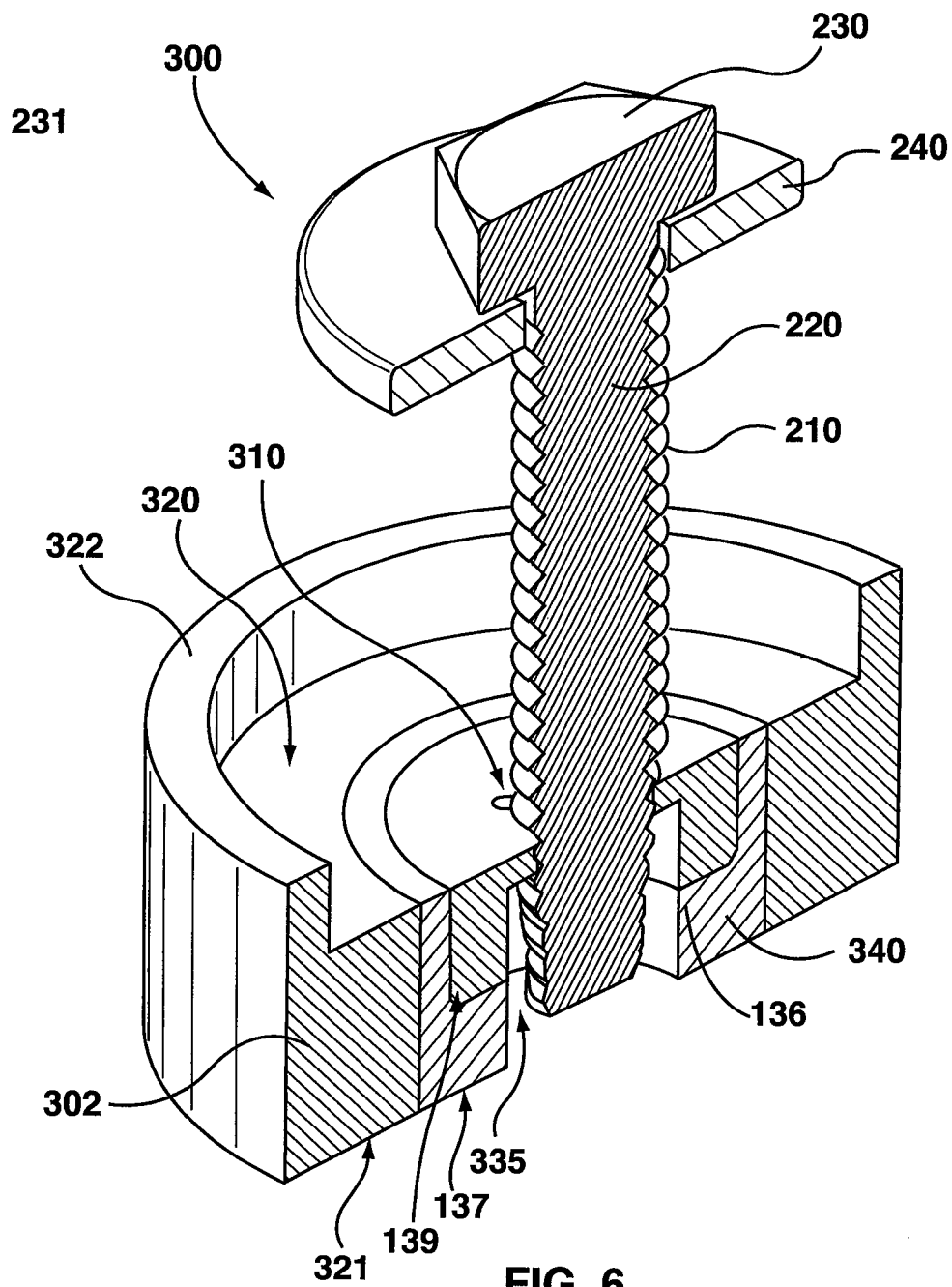
**FIG. 3**



**FIG. 4**

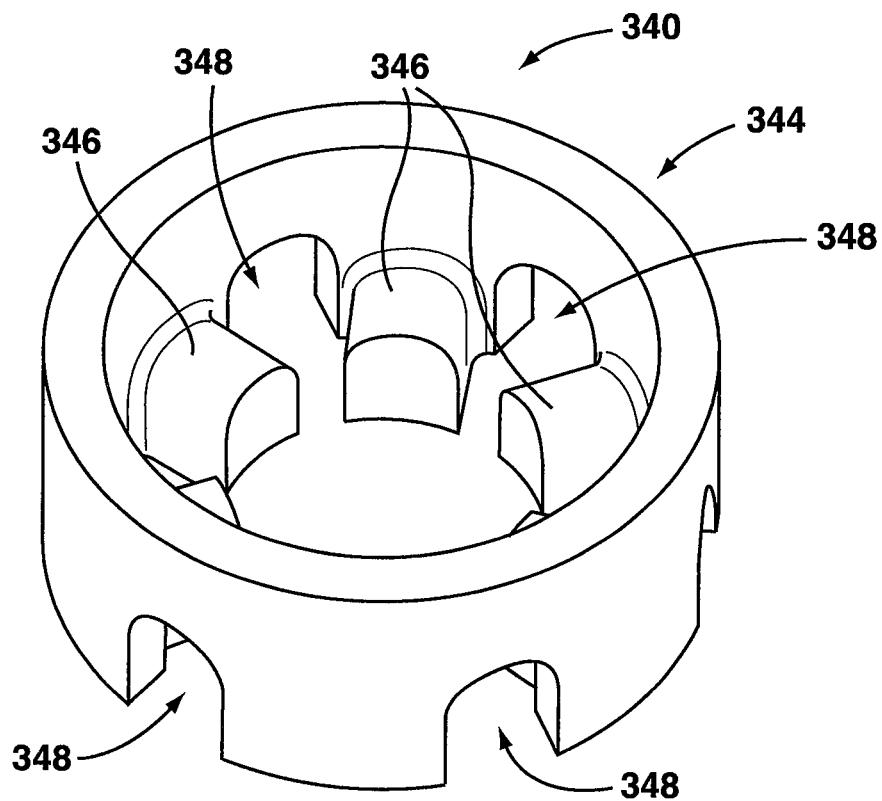


**FIG. 5**

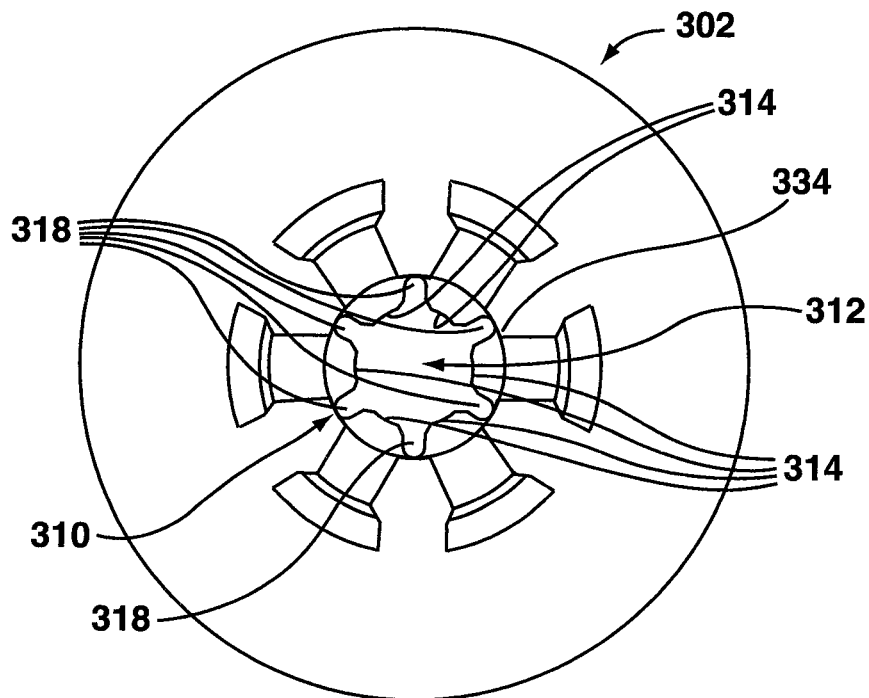


**FIG. 6**

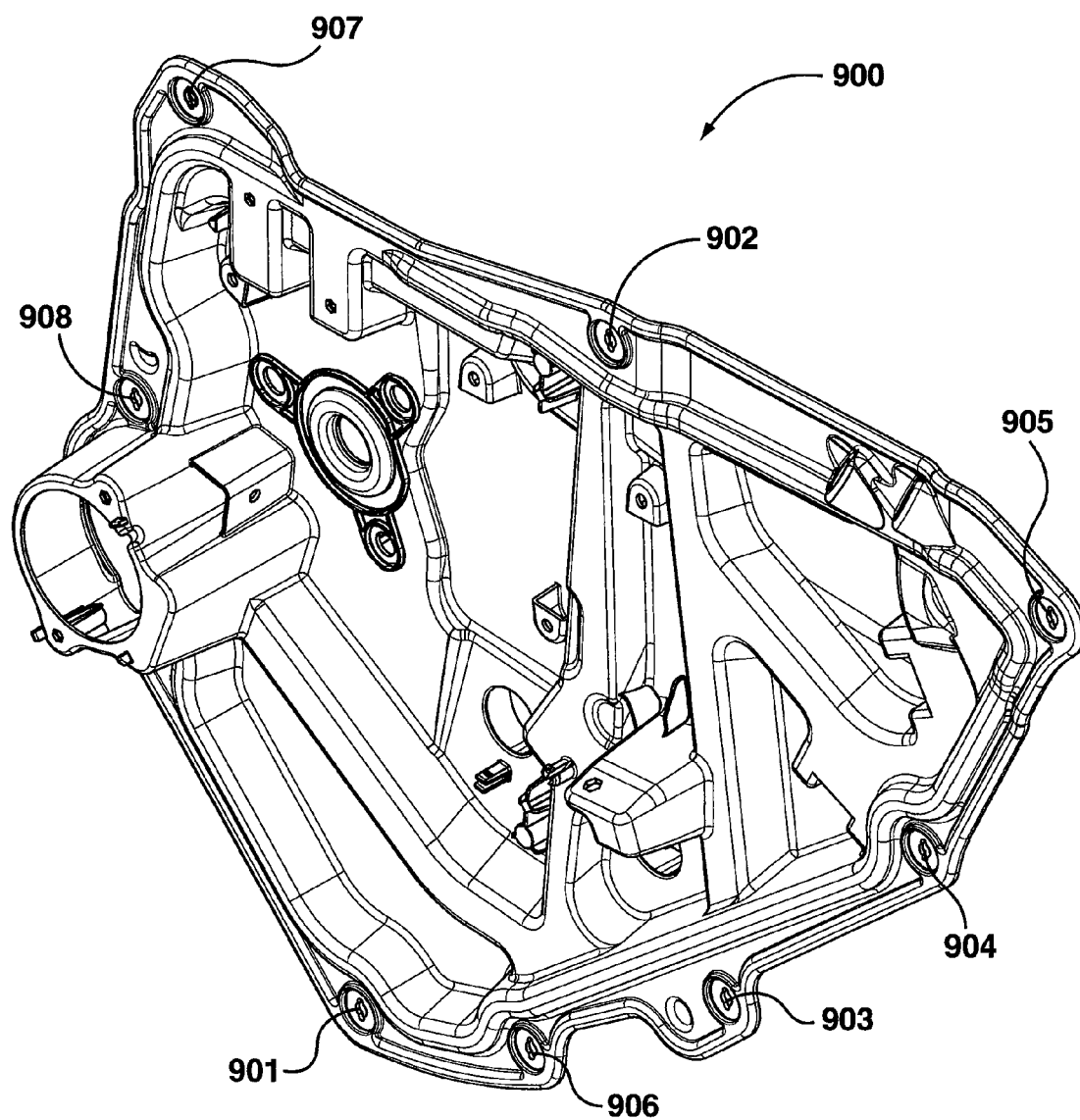




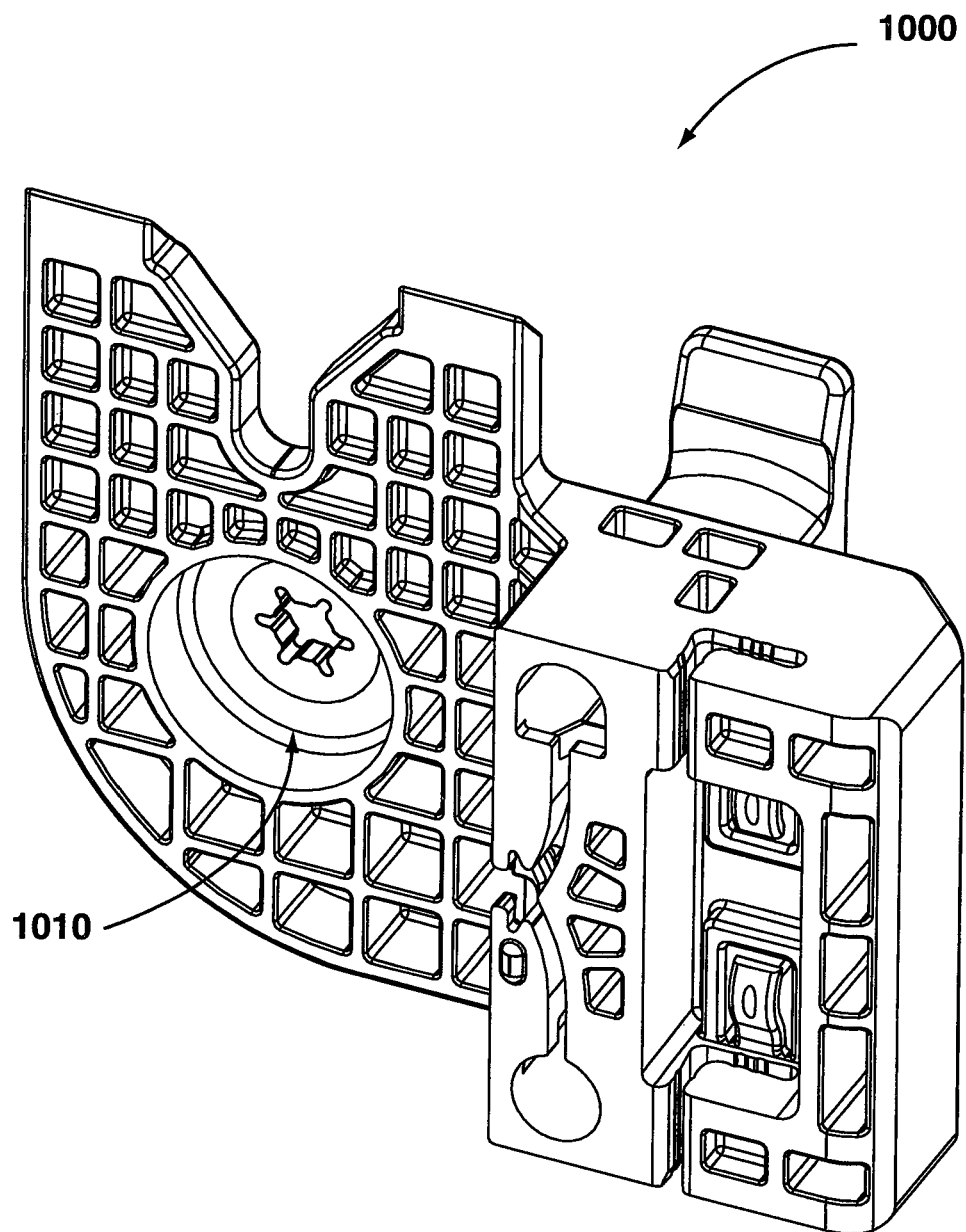
**FIG. 7**

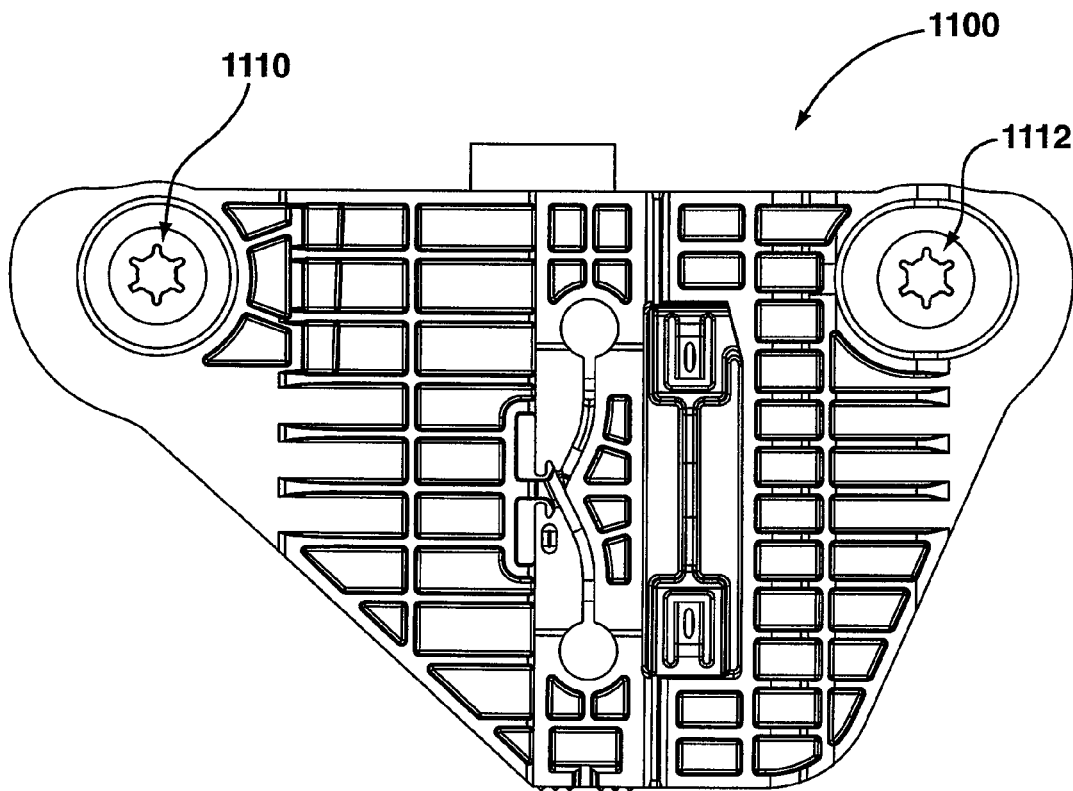


**FIG. 8**



**FIG. 9**

**FIG. 10**



**FIG. 11**

1

**FASTENER RETAINING DEVICE****CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is a continuation application of PCT International Patent Application No. PCT/CA2013/000030 filed Jan. 17, 2013 which claims the benefit of U.S. Provisional Application 61/587,286, filed Jan. 17, 2012, the entirety of which is incorporated herein by reference.

**FIELD**

The present disclosure relates generally to automobile assembly, more particularly to fasteners and devices to retain the fastener in a pre-attachment position. The disclosure also relates to modular assemblies for vehicles that use a carrier component that is attached to the vehicle.

**BACKGROUND**

The current trend in the automobile manufacturing sector, as described in U.S. Pat. No. 7,743,559 to Papi et al. and incorporated by reference herein, is to group components to obtain modular systems that simplify and facilitate mounting instead of mounting individual elements separately. One example of this type of modular system is to assemble hardware components onto a carrier panel that is then mounted to the vehicle on the assembly line. For example, a door carrier can have several accessories or functional components of the door pre-mounted, such as elements of the window lift, the lock, impact absorption systems, loudspeakers, etc. On the assembly line the door carrier is attached to the door to facilitate the final assembly of the vehicle and reduces the assembly times. Therefore, the use of this type of modular carrier simplifies the assembly of the functional components, as these components are pre-mounted on a single carrier that can be mounted on the vehicle in a single assembly stage.

Attachment of the carrier to the vehicle involves assembly line workers handling, inserting and seating every fastener for the carrier. For a typical door carrier this can involve handling 8 to 12 attachment screws for each carrier. Handling and insertion of fasteners increases the line time involved for installing components, particularly carriers. The potential for dropping or mishandling fasteners can cause delays that decrease the productivity of the entire assembly line.

**SUMMARY**

Accordingly, there is provided an object to be fastened by a fastener, the fastener having a shaft with a longitudinal axis and having a shoulder extending outwardly from the longitudinal axis beyond the shaft. The object comprises an integrally moulded object body having a fastener retaining portion and a fastener clearance portion. The fastener retaining portion defines an aperture to engage the fastener shaft, the aperture having at least one fastener-engaging edge for retaining the fastener in a pre-attachment position. The fastener retaining portion is deformable to allow the longitudinal axis of the fastener to move from the pre-attachment position laterally into the fastener retaining portion. The fastener clearance portion is spaced about the fastener retaining portion and extends longitudinally away from the fastener retaining portion to provide a mounting face 137 that defines a plane that the fastener does not extend past in the pre-attachment position. In some aspects, the aperture can have at least two opposing fastener-engaging edges.

2

In some aspects, the integrally moulded object body further comprises a compression portion that is spaced about the fastener retaining portion such that the fastener compression portion engages the fastener shoulder as the fastener is inserted longitudinally, the compression portion having a first thickness greater than a second thickness of the fastener retaining portion. In some aspects, the fastener clearance portion can have a third thickness that is the same as the first thickness of the compression portion. In yet other aspects, the fastener compression portion and fastener clearance portion can be the same portion.

In still other aspects, the compression portion can comprise a partially overmoulded bushing exposed on one surface toward the shoulder of the fastener and on an opposing surface. The bushing has a greater compressive strength than an overmould material of the integrally moulded object body to provide increased torque retention. In related aspects, the bushing can be shaped to allow for the flow through of overmould material.

In some aspects, the fastener retaining portion can have areas of weakness to provide for deformation of the fastener retaining portion. The fastener retaining portion can include one or more radial extensions that extend outwards towards a perimeter. The radial extensions can be cutouts through the central portion or a series of perforations through the fastener retaining portion. The radial extensions can be contiguous or non-contiguous with the aperture.

According to another aspect, the object is a first vehicle component for attachment to a second vehicle component during vehicle assembly, the first vehicle component having a plurality of fastener retaining portions and a corresponding plurality fastener clearance portions. For example, the first vehicle component can be a door carrier plate and the second vehicle component can be a door inner panel. The first vehicle component can have fasteners in the pre-attachment position in each of the fastener-retaining portions. The diameter of the fastener retaining portions can correspond with the off-center tolerances of the corresponding holes in the second vehicle component.

**BRIEF DESCRIPTION OF THE DRAWINGS**

For a better understanding of the various embodiments described herein and to show more clearly how they may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings which show at least one exemplary embodiment, and in which:

FIG. 1 is a perspective view of an embodiment of a fastener-retaining device;

FIG. 2 is a perspective view of a cross-section through the center of the embodiment of FIG. 1;

FIG. 3 is a cross section through the center of the embodiment of FIG. 1 further including a fastener in a pre-attachment position;

FIG. 4 is a perspective view of the cross section of the embodiment of FIG. 3;

FIG. 5 is a perspective view of a cross section of an embodiment of the fastener-retaining device showing the fastener engaged with a nut in an off-center attachment position;

FIG. 6 is a perspective view of a cross section an alternative embodiment of a fastener retaining device having an internal metal bushing;

FIG. 7 is a perspective view of the metal bushing of the embodiment of FIG. 6;

FIG. 8 is a bottom plan view of the body of the embodiment of FIG. 6 with the bushing removed;

3

FIG. 9 is a perspective view of a door carrier panel having a plurality of fastener-retaining devices;

FIG. 10 is a perspective view of a window regulator lifter plate having a single fastener-retaining device; and

FIG. 11 is a front view of a window regulator lifter plate having two fastener-retaining devices.

#### DESCRIPTION OF VARIOUS EMBODIMENTS

It will be appreciated that for simplicity and clarity of illustration, where considered appropriate, numerous specific details are set forth in order to provide a thorough understanding of the exemplary embodiments described herein. However, it will be understood by those of ordinary skill in the art that the embodiments described herein may be practiced without some of these specific details. In other instances, well-known methods, procedures and components have not been described in detail so as not to obscure the embodiments described herein.

The term “fastener” as used herein refers a piece of hardware for mechanically attaching two or more objects together. Preferably, the fastener is a threaded fastener that has a helical ridge wrapped around the external cylindrical shaft, such as a screw or a bolt, for example, but other fastener variations may be used as known to a person skilled in the art. The term “nut” is also used to refer to an object that mates with the fastener to provide attachment. Preferably, the nut comprises an internal helical thread that mates with the fastener but other variants known to a person skilled in the art can be used.

Reference is now made to the FIGS. 1-5 that illustrate a fastener-retaining device 100 having a body 102 with a fastener retaining portion 110 having an aperture 112 defined therein. Fastener retaining portion 110 is larger than the diameter of a fastener shaft 220 and can yield to allow positioning of fastener 200 almost anywhere within the fastener retaining portion 110 to account for manufacturing tolerances. Body 102 of fastener retaining device 100 can be integrally moulded into the object that is to be fastened.

Aperture 112 retains a fastener 200 in a pre-attachment position by engaging a fastener shaft 220 inserted through aperture 112 as shown in FIG. 3, for example. Aperture 112 of fastener retaining portion 110 allows fastener 200 to be positioned in advance of installation of a part having fastener-retaining device 100. Fastener 200 has a shaft 220 with a longitudinal axis 201 and a shoulder 231 that extends outwardly from the longitudinal axis 201. The shoulder 231 can be formed from the fastener head 230 or a washer 240. The pre-attachment position has fastener 200 placed within aperture 112 ready to be torqued by a nut runner as shown in FIGS. 3 and 4. During installation, fastener 200 is torqued to threadingly engage with nut 250 until the shoulder 231 of fastener 200 (e.g. head 230 or washer 240) engages a top surface 120 of fastener-retaining device 100. Fastener-retaining device 100 allows positioning fastener 200 in a pre-attachment position through shipping until fastening to allow for a much more efficient installation process on the assembly line.

Fastener retaining portion 110 and aperture 112 can deform to engage and retain fastener shaft 220 in the pre-attachment position shown in FIGS. 3 and 4. Aperture 112 is shaped to engage fastener shaft 220 to retain fastener 200 in the pre-attachment position. Shape of aperture 112 and thickness of fastener retaining portion 110 can control the force to retain fastener 200, and is preferably designed to yield to force of the torquing tool, such as a nut runner typically used in auto assembly.

Shape of aperture 112 can also provides for initial threading of fastener 200 to assist retaining fastener 200 at the

4

appropriate height. In some embodiments, aperture 112 can have a single continuous engagement edge (e.g. a rounded or circular aperture shape) that engages fastener shaft 220 in a pre-attachment position. Aperture 112 can have at least two opposing engagement edges, such as engagement edges 114 and 116 as shown in FIGS. 1 and 2, that engage threads 210 of fastener shaft 220. Engagement edges can be directly opposing, as illustrated, or aperture 112 could define an odd number of opposing engagement edges, such as three, for example, that can be oriented as an equilateral triangle with each edge engaging the threads 210 of fastener shaft 220.

Fastener retaining portion 110 can have areas of weakness to assist with deformation. In some embodiments, areas of weakness can have a reduced thickness to allow crushing or deformation of fastener retaining portion 110. As illustrated in the cross section of fastener-retaining device 100 shown in FIGS. 2-5, fastener retaining portion 110 can have a reduced thickness relative to body 102 to facilitate deformation or crushing of fastener retaining portion 110 when attaching fastener 200. Thickness of areas of weakness controls the yield force for adjusting the position of fastener 200 away from central axis 101 of fastener retaining portion 110.

Fastener retaining portion 110 can also define areas of weakness by having one or more radial extensions 118 and 119 that are cutouts that extend towards the outer perimeter of fastener retaining portion 110. Radial extensions 118 and 119 allow fastener retaining portion 110 to deform during attachment of fastener 200 to allow longitudinal axis 201 of fastener 200 to move off-center of aperture 112 in fastener retaining portion 110. For example, FIG. 5 illustrates longitudinal axis 201 of fastener 200 moved laterally from central axis 101 through center of fastener retaining portion 110 to accommodate position of nut 250. Radial extensions 118 and 119 can be cutouts that are preferably narrower than the width defined by opposing engagement edges 114 and 116. Radial extensions 118, 119 can be either contiguous with aperture 112, as shown, or non-contiguous with aperture 112 (e.g. the radial extensions do not extend into aperture).

In other embodiments, radial extensions can be used to provide for easy separation of two sections of fastener retaining portion 110 due to the fastening forces perpendicular to longitudinal axis 201 of fastener 200. Separating two sections of fastener retaining portion 110 is another mode of deformation of fastener retaining portion 110. For example, radial extension can be implemented as narrow slits, perforations or lines of reduced thickness that allows fastener shaft to separate two sections of fastener retaining portion 110. These structures allow two sections of fastener retaining portion 110 to separate to allow the longitudinal axis 201 of fastener 200 to move laterally from the pre-attachment position.

In other embodiments, fastener retaining portion 110 can have multiple radial extensions to allow for easy deformation of fastener retaining portion 110 to accommodate off-center positioning of longitudinal axis of fastener 200. In some embodiments, such as that illustrated in FIG. 8, radial extensions can be a number of narrow slits that extend outwards from the center of aperture 112 towards the perimeter of fastener retaining portion 110.

Fastener retaining portion 110 is preferably circular and has a diameter larger than fastener shaft 220 to provide a tolerance for positioning fastener 200 within fastener retaining portion 110 when in the attached position. The radius of fastener retaining portion 110 should be selected based on the tolerances of the hole or nut 250 position. Fastener retaining portion 110 can have other shapes that accommodate this

5

tolerance within the shape. For example, fastener retaining portion **110** could be square so long as the tolerance radius is incorporated therein.

Other shapes of fastener retaining portion **110** can be used to limit the tolerance to only one or two directions. These shapes can be defined by areas of weakness of fastener retaining portion **110**. For example, fastener retaining portion **110** can only allow deformation in a + shape to limit tolerance to two perpendicular directions. Alternatively, fastener retaining portion **110** can allow deformation in a single direction.

Body **102** of fastener-retaining device **100** comprises a fastener clearance portion **136** that is spaced about the fastener retaining portion **110**. The fastener clearance portion **136** extends longitudinally away from the fastener retaining portion to provide a mounting face **137** that engages the object to which body **102** is being attached onto. The fastener does not extend past the plane defined by the mounting face **137** in the pre-attachment position.

An example of fastener clearance portion **136** can be illustrated by extension **132** that extends from bottom surface **130** of body **102** that defines an inner bore **135** having a diameter greater than fastener shaft **220**. The end **133** of extension **132** can provide a mounting face **137**. An alternate example of fastener clearance portion **136** can include outer ring **140** extending from bottom surface **130** of body **102** that has an end portion **142** that could also serve as a mounting face **137**. Mounting face **137** can assist to position fastener **200** in the pre-attachment position such that end **233** of fastener **200** does not extend past mounting face **137** defined by either cylindrical extension **132** or outer ring **140**.

Top surface **120** of body **102** of fastener-retaining device **100** can define a countersink or counterbore to allow head **230** of fastener **200** to be at least partially recessed with respect to top-most surface **122** of fastener-retaining device **100**. Alternatively, as illustrated by FIG. 5, a counterbore can allow washer **240** to be recessed so long as the counterbore has a large enough diameter to accommodate positional tolerances.

Body **102** of fastener-retaining device **100** further comprises a compression portion **139** that is spaced about fastener retaining portion **110** such that the shoulder **231** (e.g. head **230** or washer **240**) of fastener **200** engages the compression portion **139** as the fastener is inserted into the attachment position. The compression portion **139** transfers the force from the shoulder **231** of the fastener **200** to the object that body **102** is being attached onto. The compression portion **139** has thickness that is greater than fastener retaining portion **110**. In the embodiment illustrated in FIGS. 1 to 5, compression portion **139** can comprise extension **132** between top surface **120** and end **133**. In some embodiments, the compression portion **139** and the fastener clearance portion **136** can be the same, such as the extension **132** for example.

Reference is next made to FIG. 5 that illustrates body **102** of fastener-retaining device **100** integrally moulded with a first vehicle component **103** for attaching to a second vehicle component **105** having a hole **249** for receiving fastener **200**. In some embodiments, hole **249** can be provided with a nut **250** for engaging the threads of fastener **200**. First vehicle component **103** can be, for example, a carrier plate (e.g. a door carrier plate), a lifter plate, or another vehicle component such as rails of a plastic window regulator to be attached to a carrier plate or inner door panel. The second vehicle component **105** can be, for example, a part of the vehicle frame, a door inner panel, or other vehicle component.

Reference is next made to FIG. 6 that illustrates a perspective view of a cross section of an alternative embodiment of a fastener-retaining device **300** having a bushing **340** in the

6

fastener compression portion **139** that is exposed on top surface **320** and bottom surface **321** of body **302**. Similar features of FIG. 6 are similarly numbered as those in FIGS. 1-5 and can provide a similar fastener-retaining function as described above. Fastener-retainer device **300** provides improved torque retention to fastener **200** by allowing bushing **340** to engage with shoulder **231** of fastener **200** in the attachment position.

The material of bushing **240** is comprised of a material with increased compressive strength compared to material of body **102** in order to improve torque retention. Bushing **240** provides improved compressive strength to retain the fastener under load over time. Preferably, bushing **340** is made of metal to provide metal-to-metal contact with shoulder **231** of fastener **200** and the second vehicle component that the first component is being attached onto. Bushing **240** can be composed, for example, from a wide range of steels or other metals. Other materials of sufficient compressive strength may also be used, such as carbon fiber composites from example.

FIG. 7 illustrates an embodiment of bushing **340** with body **302** removed to illustrate shape of bushing **340** to allow overmoulding. Bushing **340** can comprise an outer cylindrical ring **344** that has inward projections **346**. Bushing **340** can also define cutouts **348** in outer cylindrical ring **344** that allow composite material of body **102** to flow through bushing **340** during the molding process.

Reference is next made to FIG. 8 which shows a bottom plan view of body **302** of fastener-retainer device **300** with bushing **340** removed. Material of body **302** is able to flow around bushing **340** as illustrated by conformed shape of body **302**.

FIG. 8 also illustrates an alternative embodiment of fastener retaining portion **310** that includes a number of radial extensions **318** that extend outwards from aperture **312** towards perimeter of fastener retaining portion **310**. Radial extensions **318** in fastener retaining portion **310** allow shaft **220** to move off-center laterally from aperture **312**. Aperture **312** also has a number of engagement edges **314** that engage with threads **210** of fastener shaft **220** in order to retain fastener **200** in a pre-attachment position.

Reference is next made to FIG. 9 which illustrates a perspective view of a first vehicle component **900** having fastener-retaining devices **901-908** around the outer perimeter. The first vehicle component can be carrier plate as illustrated in FIG. 9. First vehicle component **900** can include fasteners **200** retained in each of fastener-retaining devices **901-908** so that first vehicle component **900** be placed into position with a corresponding second vehicle component and attached by torquing fasteners **200**. First vehicle component **900** of FIG. 9 is a door carrier plate that is designed for attachment to a door inner panel.

First vehicle component **900** can be manufactured to include a number of fastener-retaining devices **901-908** that can have their body **102** formed as embossments of first vehicle component **900**. First vehicle component **900** is preferably manufactured from a composite material and molded into the desired shape. First vehicle component **900** can be molded to comprise embossments that define fastener-retaining devices **100** such as those described above. First vehicle component **900** can be manufactured using a number of composite materials to provide strength and low weight. For example, a door carrier plate is typically made from plastic, such as a polypropylene with 40% glass fill for structural reinforcement. Other composite materials will occur to those of skill in the art. Other reinforcement fibers contemplated

include Kevlar, carbon fibers, and hemp, and other reinforcement materials will occur to those of skill in the art.

Fastener-retaining devices **901-908** can be integrally formed with first vehicle component **900** through the molding process. First vehicle component **900** can then be cut, drilled or trimmed as required. The term “integral”, and its derivations, are used herein to indicate a part that is fabricated from a single piece of material. The term “integral” as used herein specifically excludes other means for maintaining parts fixed together as a single unit. More particularly, the term “integral” is used specifically to exclude known variations for retaining a fastener in a pre-attachment position (e.g. using adhesives, separate mechanical retention device, etc.).

After first vehicle component **900** is molded and trimmed, other accessories and devices can be mounted to first vehicle component **900**. For example, a door carrier plate can have several accessories or functional components of the door pre-mounted, such as elements of the window lift, the lock, impact absorption systems, loudspeakers, etc. Fasteners **200** can be positioned in a pre-attachment position into fastener-retaining devices **901-908**. For example, fasteners **200** can be threaded into apertures **112** until end **233** of fastener **200** is flush with extension end **133** of cylindrical extension **132**. Alternatively, apertures **112** can deform to allow fastener to simply be pushed through aperture **112** to retain fastener **200**. First vehicle component **900** with attached accessories, functional components, and fasteners in a pre-attachment position can then be shipped to the vehicle assembly line for attachment to a corresponding second vehicle component.

The second vehicle component, such as door inner panel, for example, typically has holes with a nut welded thereto in order to attach the door carrier plate. The holes and welded nuts on the vehicle frame have a certain tolerance that the carrier plate must accommodate to firmly attach the carrier panel without warping or breaking the carrier plate. For example, door inner panel has holes that can have a true position of 3.0 mm in diameter that the door carrier panel accommodates with fastener-retaining devices **100** that have a fastener retaining portion **110** with a corresponding diameter that yields to allow movement of fastener **200**. The fastener retaining portion **110** of each of the fastener-retaining devices **100** of the door carrier plate corresponds with the off-center tolerance of the corresponding hole and nut in the door module.

On the vehicle assembly line the first vehicle component **900** is received with the fasteners **200** in a pre-attachment position in fastener-retaining devices **100**. The assembly line operator positions the first vehicle component to align the retained fasteners **200** with corresponding holes and nuts in the second vehicle component. Once the first vehicle component **900** is in position, the assembly line worker can begin torquing the retained fasteners **200** with a nut runner in order to attach the first vehicle component **900** to the second vehicle component. For example, using a carrier plate with retained fasteners reduces handling of fasteners and the carrier plate resulting in a reduced line time.

The fastener retaining portion **110** of fastener-retaining devices **100** can deform to accommodate tolerances in the position of holes and nuts in the second vehicle component, such as the vehicle frame or an inner door panel. If the fastener **200** is positioned off-center from the hole/nut, fastener retaining portion **110** can deform to allow fastener **200** to be angled slightly for initial engagement with the threads of nut **250**. Engaging the threads of an off-center nut **250** will provide a force perpendicular to central axis **101** applied by fastener shaft **220** against fastener retaining portion **110**. Fastener retaining portion **110** will yield or deform to this force to

allow longitudinal axis **201** of fastener **200** to be positioned off-center from central axis **101** of fastener retaining portion **110**.

FIGS. **10** and **11** illustrate an embodiment of first vehicle components as window regulator lifter plates that have fastener-retaining devices positioned on window regulator lifter plates **1000** and **1100**, respectively. Window regulator lifter plates typically have fewer points of attachment than a carrier plate, for example lifter plate **1000** of FIG. **10** has a single fastener-retaining device **1010** and lifter plate **1100** has two fastener-retaining devices **1110**, **1112**. Maintaining torque on the fastener is more of an issue for window regulators where components can vibrate more and potentially work fasteners loose. Preferably, fastener-retaining devices **1010**, **1110**, and **1112** comprise a bushing, such as bushing **340**, previously described, that provides improved torque retention. Lifter plates **1000**, **1100** are typically composed of an acetal homopolymer resin, such as that sold under the trademark Delrin by Dupont.

While the exemplary embodiments have been described herein, it is to be understood that the invention is not limited to the disclosed embodiments. The invention is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, and scope of the claims is to be accorded an interpretation that encompasses all such modifications and equivalent structures and functions.

I claim:

1. An object to be fastened by a fastener, the fastener having a shaft with a longitudinal axis and having a shoulder extending outwardly from the longitudinal axis beyond the shaft, the object comprising:

an integrally moulded object body having a fastener retaining portion and a fastener clearance portion,

the fastener retaining portion defining an aperture with an axis for receiving the fastener shaft, the aperture for receiving the fastener within the aperture in a pre-attachment position, the fastener retaining portion having an area of weakness being deformable for adjusting position of the longitudinal axis of the fastener laterally away from the axis and into the area of weakness of the fastener retaining portion by separation of a pair of sections of the area of weakness, and

the fastener clearance portion being spaced about the fastener retaining portion and extending longitudinally from the fastener retaining portion to provide a mounting face for the pre-attachment position.

2. The object of claim 1, wherein the integrally moulded object body has a compression portion spaced about the fastener retaining portion such that the fastener compression portion engages the fastener shoulder as the fastener is inserted longitudinally, the compression portion having a first thickness greater than a second thickness of the fastener retaining portion.

3. The object of claim 2, wherein the fastener compression portion and fastener clearance portion are the same portion.

4. The object of claim 3, wherein the fastener retaining portion has multiple areas of the area of weakness to provide for the deformation.

5. The object of claim 2, wherein the compression portion comprises a partially overmoulded bushing exposed on one surface toward the shoulder of the fastener and on an opposing surface; and wherein the bushing has a greater compressive strength than an overmould material of the integrally moulded object body.

6. The object of claim 5, wherein the bushing is shaped to allow for flow through of the overmould material.



7. The object of claim 2, wherein the fastener retaining portion has areas of weakness to provide for deformation.

8. The object of claim 1, wherein the fastener retaining portion has multiple areas of the area of weakness to provide for the deformation.

5

9. The object of claim 8, wherein the multiple areas of weakness have a reduced thickness relative to a second thickness of the fastener retaining portion adjacent to the multiple areas of weakness.

10. The object of claim 8, wherein the multiple areas of weakness comprise one or more radial extensions that extend outwards.

10

11. The object of claim 1, wherein the object is a first vehicle component for attachment to a second vehicle component during vehicle assembly, the first vehicle component having a plurality of fastener retaining portions and a corresponding plurality fastener clearance portions.

15

12. The object of claim 11, wherein the first vehicle component is any one of a carrier plate and a window regulator plate, and the second vehicle component is any one of a door inner panel and a vehicle frame.

20

13. The object of claim 11, wherein the first vehicle component has fasteners in the pre-attachment position in each of the fastener retaining portions.

14. The object of claim 11, wherein a diameter of the fastener retaining portions corresponds with an off-center tolerance of a corresponding hole in the second vehicle component.

25

15. The object of claim 1 wherein the area of weakness that extends outwardly from the aperture limiting the deformation in one or more directions.

30

\* \* \* \* \*